AMENDMENT TO THE CLAIMS

Please **AMEND** claims 1, 47 and 53.

Please **ADD** claims 56 and 57.

No new matter has been added. This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

1. (Currently Amended) A fluids analyzer for determining the pH of formation fluid in a region of earth formation surrounding a borehole, comprised of:

   a reagent container having a mixture of two or more reagents wherein said reagent mixture is capable of detecting a pH range broader than each reagent individually; and

   means for mixing formation fluid with said reagent mixture ~~downhole~~.

2. (Original) The fluids analyzer of claim 1, further comprised of:

   spectral analyzer means, coupled to receive a mixture of formation fluid and reagent mixture from said mixing means for analyzing the optical density of said mixture of formation fluid and reagent mixture in two or more spectral channels.

3. (Original) The fluids analyzer of claim 1, wherein the reagent mixture is capable of measuring pH to an accuracy of about 0.5 units or better.

4. (Original) The fluids analyzer of claim 1, wherein said reagents show similar direction of spectral shift with changes in pH.

5. (Original) The fluids analyzer of claim 2, wherein said two or more spectral channels have bandwidths of approximately 10-20 nm.

6. (Original) A fluids analyzer for determining the pH of formation fluid in a region of earth formation surrounding a borehole, comprised of:

   a reagent container having a mixture of two or more reagents wherein said reagent mixture is capable of detecting pH at a higher accuracy than each reagent individually; and

   means for mixing formation fluid with said reagent mixture downhole.

7. (Original) The fluids analyzer of claim 6, further comprised of:

   spectral analyzer means, coupled to receive a mixture of formation fluid and reagent mixture from said mixing means for analyzing the optical density of said mixture of formation fluid and reagent mixture in two or more spectral channels.

8. (Original) The fluids analyzer of claim 6, wherein said reagents show similar direction of spectral shift with changes in pH.

9. (Original) The fluids analyzer of claim 7, wherein said two or more spectral channels have bandwidths of approximately 10-20 nm.

10. (Original) A method of making a reagent mixture for determining the pH of a sample comprising:

    a. identifying a target pH range;
    b. mixing known relative quantities of two or more reagents to create a reagent mixture, wherein said reagent mixture is capable of detecting a pH range broader than each reagent individually;
    c. optimizing said reagent mixture to identify one or more sets of reagents that satisfy the targeted pH range; and
    d. characterizing at least one set of reagents.

11. (Original) The method of claim 10, wherein optimizing said reagent mixture includes identifying one or more sets of reagents based on the thermodynamic acid dissociation constants of said reagents.

12. (Original) The method of claim 10, wherein optimizing said reagent mixture includes identifying optimal relative quantities of said reagents.

13. (Original) The method of claim 10, wherein optimizing said reagent mixture includes identifying two or more optimal spectral channels.

14. (Original) The method of claim 10, wherein characterizing at least one of said one or more sets of reagents includes developing a relationship between optical density ratio and pH.

15. (Original) The method of claim 14, further comprising checking for a unique correlation between optical density ratio and pH.

16. (Original) The method of claim 10, wherein characterizing at least one of said one or more sets of reagents includes performing an error analysis.

17. (Original) The method of claim 10, wherein optimizing said reagent mixture includes developing a forward model based on the thermodynamic acid dissociation constants of the reagents, relative quantities of the reagents, and two or more spectral channels wherein said reagents have elevated optical densities.

18. (Original) The method of claim 17, further comprising developing an algorithm based on said forward model to identify one or more sets of reagents having optimal thermodynamic acid dissociation constants.

19. (Original) The method of claim 18, further comprising analyzing the forward model using the optimal thermodynamic acid dissociation constants of the reagents,

relative quantities of the reagents, and two or more spectral channels wherein said reagents have elevated optical densities.

20. (Original) The method of claim 19, further comprising developing an algorithm based on said forward model to identify one or more sets of reagents having optimal relative quantities of reagents.

21. (Original) The method of claim 20, further comprising analyzing the forward model using the optimal thermodynamic acid dissociation constants of the reagents, the optimal relative quantities of the reagents, and two or more spectral channels wherein said reagents have elevated optical densities.

22. (Original) The method of claim 21, further comprising developing an algorithm based on said forward model to identify one or more sets of reagents having two or more optimal spectral channels.

23. (Original) The method of claim 22, wherein characterizing at least one of said one or more sets of reagents includes developing a relationship between optical density ratio and pH.

24. (Original) The method of claim 23, further comprising checking for a unique correlation between optical density ratio and pH.

25. (Original) The method of claim 24, wherein characterizing at least one of said one or more sets of reagents includes performing an error analysis.

26. (Original) The method of claim 25, further comprising optimizing absolute concentration of the reagent mixture.

27. (Original) A method of making a reagent mixture for determining the pH of a sample comprising:

a. identifying a target pH range;

b. mixing known relative quantities of two or more reagents to create a reagent mixture, wherein said reagent mixture is capable of detecting pH at a higher accuracy than each reagent individually;

c. optimizing said reagent mixture to identify one or more sets of reagents that satisfy the targeted pH range; and

d. characterizing at least one set of reagents.

28. (Original) The method of claim 25, wherein optimizing said reagent mixture includes identifying one or more sets of reagents based on the thermodynamic acid dissociation constants of said reagents.

29. (Original) The method of claim 25, wherein optimizing said reagent mixture includes identifying optimal relative quantities of said reagents.

30. (Original) The method of claim 25, wherein optimizing said reagent mixture includes identifying two or more optimal spectral channels.

31. (Original) The method of claim 27, wherein characterizing at least one of said one or more sets of reagents includes developing a relationship between optical density ratio and pH.

32. (Original) The method of claim 31, further comprising checking for a unique correlation between optical density ratio and pH.

33. (Original) The method of claim 27, wherein characterizing at least one of said one or more sets of reagents includes performing an error analysis.

34. (Original) The method of claim 27, wherein optimizing said reagent mixture includes developing a forward model based on the thermodynamic acid dissociation

constants of the reagents, relative quantities of the reagents, and two or more spectral channels wherein said reagents have elevated optical densities.

35. (Original) The method of claim 34, further comprising developing an algorithm based on said forward model to identify one or more sets of reagents having optimal thermodynamic acid dissociation constants.

36. (Original) The method of claim 35, further comprising analyzing the forward model using the optimal thermodynamic acid dissociation constants of the reagents, relative quantities of the reagents, and two or more spectral channels wherein said reagents have elevated optical densities.

37. (Original) The method of claim 36, further comprising developing an algorithm based on said forward model to identify one or more sets of reagents having optimal relative quantities of reagents.

38. (Original) The method of claim 37, further comprising analyzing the forward model using the optimal thermodynamic acid dissociation constants of the reagents, the optimal relative quantities of the reagents, and two or more spectral channels wherein said reagents have elevated optical densities.

39. (Original) The method of claim 38, further comprising developing an algorithm based on said forward model to identify one or more sets of reagents having two or more optimal spectral channels.

40. (Original) The method of claim 39, wherein characterizing at least one of said one or more sets of reagents includes developing a relationship between optical density ratio and pH.

41. (Original) The method of claim 40, further comprising checking for a unique correlation between optical density ratio and pH.

42. (Original) The method of claim 39, wherein characterizing at least one of said one or more sets of reagents includes performing an error analysis.

43. (Original) The method of claim 42, further comprising optimizing absolute concentration of the reagent mixture.

44. (Original) A method for determining the pH of formation fluid in a region of earth formation surrounding a borehole, comprising:

   a. storing a reagent mixture in a reagent container coupled to a fluids analyzer, wherein said reagent mixture is capable of detecting a pH range broader than each reagent individually;
   b. positioning the fluids analyzer downhole;
   c. drawing formation fluid into the fluids analyzer;
   d. mixing formation fluid with the reagent mixture; and
   e. analyzing the optical density of said mixture of formation fluid and reagent mixture in one or more spectral channels to determine the pH of the formation fluid.

45. (Original) The method of claim 44, wherein said pH is determined to an accuracy of 0.5 pH units or less.

46. (Original) The method of claim 44, wherein analyzing the optical density is performed using one channel and includes determining the absolute concentration of the reagent mixture.

47. (Currently Amended) The method of claim 44, wherein analyzing the optical density is performed using two or more channels.

48. (Original) The method of claim 47, further comprising analyzing the optical density ratio.

49. (Original) The method of claim 44, comprising obtaining optical measurements in three or more channels and performing a regression analysis using said optical measurements.

50. (Original) A method for determining the pH of formation fluid in a region of earth formation surrounding a borehole, comprising:

    a. storing a reagent mixture in a reagent container coupled to a fluids analyzer, wherein said reagent mixture is capable of detecting pH at a higher accuracy than each reagent individually;
    b. positioning the fluids analyzer downhole;
    c. drawing formation fluid into the fluids analyzer;
    d. mixing formation fluid with the reagent mixture; and
    e. analyzing the optical density of said mixture of formation fluid and reagent mixture in one or more spectral channels to determine the pH of the formation fluid.

51. (Original) The method of claim 50, wherein said pH is determined to an accuracy of 0.5 pH units or less.

52. (Original) The method of claim 50, wherein analyzing the optical density is performed using one channel and includes determining the absolute concentration of the reagent mixture.

53. (Currently Amended) The method of claim 50, wherein analyzing the optical density is performed using two or more channels.

54. (Original) The method of claim 53, further comprising analyzing the optical density ratio.

55. (Original) The method of claim 50, comprising obtaining optical measurements in three or more channels and performing a regression analysis using said optical measurements.

56. (New) The method of claim 10, wherein the reagent mixture is suitable for use in a downhole environment.

57. (New) The method of claim 27, wherein the reagent mixture is suitable for use in a downhole environment.